

CLAIMS

What is claimed is:

1. A transmit system configured as part of a first station, the first station having two or more transmitters, each associated with a channel, configured as part of a multi-channel communication system configured to modify a data signal prior to transmission by the transmitter from the first station to a second station to reduce the effects of coupling on the data signal, at least one of the transmitters in the transmit system comprising:

an input configured to receive a data signal, the data signal to be transmitted over a first channel after processing by the transmitter;

one or more filters configured to generate one or more outgoing cancellation signals, the one or more outgoing cancellation signals to be provided to one or more other transmitters in the transmit system to cancel, prior to transmission of the data signal, FEXT coupling from the first channel to one or more other channels; and

a device configured to combine one or more incoming cancellation signals from the one or more other transmitters within the transmit system with the signal, the one or more incoming cancellation signals arriving from the one or more other transmitters in the multi-channel communication system to cancel, prior to transmission of the data signal, FEXT coupling from the one or more other channels to the first channel.

2. The transmitter of Claim 1, wherein the device comprises a subtractor configured to subtract the one or more incoming cancellation signals from the data signal.

3. The transmitter of Claim 1, wherein the one or more filters comprise digital precode FEXT filters.

4. The transmitter of Claim 3, wherein a digital precode FEXT filter is associated with each of the other transmitters in the transmit system and each digital precode FEXT filter is configured to generate an incoming cancellation signal.

5. The transmitter of Claim 1, wherein the filter comprises a precode filter configured to cancel FEXT coupling.

6. The transmitter of Claim 1, further comprising a transmit precode filter in addition to the one or more filters configured to generate one or more outgoing cancellation signals.

7. A coupling precode filter system configured to modify two or more signals in a multi-transmitter, multi-channel transmit system to cancel, prior to transmission, FEXT coupling that may occur during transmission of the two or more signals through two or more channels comprising:

- a first input configured to receive a first signal;
- a second input configured to receive a second signal;
- a first filter configured to process the first signal to generate a first cancellation signal, wherein the first cancellation signal cancels at least a portion of coupling that will couple from the first signal onto the second signal during transmission;
- a second filter configured to process the second signal to generate a second cancellation signal, wherein the second cancellation signal cancels at least a portion of coupling that will couple from the second signal onto the first signal during transmission;
- a first device configured to combine the second cancellation signal with the first signal prior to transmission of the first signal; and
- a second device configured to combine the first cancellation signal with the second signal prior to transmission of the second signal.

8. The coupling precode filter system of Claim 7, wherein the first filter and second filter are configured as non-causal filters.

9. The coupling precode filter system of Claim 7, wherein the first filter is located in a first transmitter and the second filter is located in a second transmitter and

each of the first transmitter and the second transmitter further comprise a transmit precode filter.

10. The coupling precode filter system of Claim 7, wherein the first device and the second device comprise subtractors.

11. The coupling precode filter system of Claim 7, wherein the coupling precode filter system is configured to operate in a four channel environment and thereby further comprises a third filter and a fourth filter.

12. A method, for use in a multi-channel communication system having two or more transmitters, for FEXT cancellation of coupling from a first signal transmitted on a first channel to a second signal transmitted on a second channel, the method comprising:

receiving a first signal at a first transmitter;

performing first processing on the first signal to create a first processed signal;

routing the first processed signal to one or more first transmitter cancellation filters;

performing second processing on the first processed signal with the one or more first transmitter cancellation filters to create a cancellation signal;

routing the cancellation signal to a second transmitter; and

combining, prior to transmission, the cancellation signal with a second signal being processed by a second transmitter to reduce the effects of coupling of the first signal onto the second signal during transmission.

13. The method of Claim 12, wherein performing second processing comprises precode filtering utilizing a precode FEXT filter.

14. The method of Claim 12, wherein the precode FEXT filter is configured as a non-causal filter.

15. The method of Claim 12, wherein the multi-channel communication system comprises at least one station having four transmitters, each of which is associated with a channel.

16. The method of Claim 12, further comprising receiving a second cancellation signal at the first transmitter and combining the second cancellation signal with the first processed signal to reduce the effects of coupling from the second signal onto the first processed signal during transmission.

17. The method of Claim 12, wherein the combining comprises subtracting the cancellation signal from the second signal.

18. A method of FEXT cancellation in a four channel communication system, wherein a transmitter is associated with each of the first channel, second channel, third channel, and fourth channel, the method comprising:

receiving a first signal, second signal, third signal, and fourth signal at each of a first transmitter, second transmitter, third transmitter, and fourth transmitter respectively;

processing the first signal to generate a second transmitter cancellation signal, a third transmitter cancellation signal, and a fourth transmitter cancellation signal;

routing the second transmitter cancellation signal, the third transmitter cancellation signal, and a fourth transmitter cancellation signal to the second transmitter, third transmitter, and fourth transmitter respectively; and

combining the second transmitter cancellation signal, the third transmitter cancellation signal, and the fourth transmitter cancellation signal with the second signal, third signal, and fourth signal respectively, wherein the combining cancels the effects of FEXT coupling onto the second channel, third channel, and fourth channel that will occur during transmission of a signal on the first channel.

19. The method of Claim 18, wherein the communication system operates based on an Ethernet standard.

20. The method of Claim 18, wherein processing the first signal comprises:

routing the first signal to a first precode FEXT filter, a second precode FEXT filter, and third precode FEXT filter; and

processing the first signal in each of the precode FEXT filters to create the second transmitter cancellation signal, the third transmitter cancellation signal, and the fourth transmitter cancellation signal.

21. The method of Claim 18, further comprising receiving at the first transmitter one or more incoming cancellations signals from each of the second, third and fourth transmitters in the four channel communication system and combining the one or more incoming cancellations signals from each of the other transmitters with the first signal to cancel the effects of FEXT coupling on the first signal.

22. The method of Claim 18, further comprising performing transmit precode filtering on the first signal.

23. The method of Claim 18, wherein the processing is performed by one or more digital filters.

24. The method of Claim 23, wherein the transfer function of the one or more digital filters is selected to cancel ELFEXT.

25. A FEXT cancellation system for use in a multi-channel communication system comprising:

a first transmitter associated with a first channel comprising:

means for processing data to generate a first channel signal;

means for filtering the first channel signal to generate one or more outgoing cancellation signals;

means for providing the one or more outgoing cancellation signals to one or more other transmitters in the multi-channel communication system, wherein the one or more outgoing cancellation signals cancel FEXT coupling that will couple during transmission of the first channel signal onto one or more other channel signals;

means for receiving one or more incoming cancellation signal from the one or more other transmitters in the multi-channel communication system; and

means for combining the one or more incoming cancellation signals with the first channel signal to thereby cancel FEXT coupling that will couple into the first channel signal during transmission.

26. The system of Claim 25, wherein the means for combining comprises a device selected from the group of devices consisting of a subtractor and an adder.

27. The system of Claim 25, further comprising a transmit precode filter configured to process the signal to account for intersymbol interference.

28. The system of Claim 25, wherein the means for filtering comprises one or more digital precode FEXT filters.